

LUNAR NEWS

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**This issue of the
Lunar News
dedicated
to our colleague
Dr. Graham Ryder**

*See Memorial and Tribute
Pages 6 – 8*

CAPTEM Meeting – March 15 – 17, 2002

Lunar News Mission

The purpose of "Lunar News" is to provide a newsletter forum for facts and opinions about lunar sample studies, lunar geoscience, and the significance of the Moon in solar system exploration.

Editor's Notes

"Lunar News" is published by the Astromaterials Acquisition and Curation Office, Lyndon B. Johnson Space Center (JSC) of the National Aeronautics and Space Administration (NASA). It is sent free to all interested individuals. To be included on the mailing list, write to the address below. Please send to the same address any comments on "Lunar News" or suggestions for new articles.

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33rd Lunar and Planetary Science Conference

The 33rd Lunar and Planetary Science Conference will be held in Houston, Texas, on March 11 – 15, 2002. All technical sessions, both oral and poster, will be held at the South Shore Harbour Resort & Conference Center, 2500 South Shore Blvd., League City, TX 77573. A fee of \$55 (\$30 for students) will be assessed each participant to cover conference services. Foreign participants who state on the registration form that they have a currency exchange problem may pay in cash at the meeting and avoid the \$20 late fee if they return the form by the deadline. The registration and a reception will be held at the LPI Sunday, March 10, from 5:00 to 8:00 p.m. The chili cook-off and barbecue dinner will be held on Wednesday, March 13, from 6:00 to 9:30 p.m. Guest tickets for the cook-off and dinner will be available at the registration desk for \$15 per person. For more information, call the LPI Publications and Program Services Department (registration: 281-486-2142 or logistics and program: 281-486-2158).





Curator's Comments

Gary Lofgren
NASA JSC

I continue to be amazed at the number of people that I tell that we are still working on the moon and they are surprised. Some of these people work at NASA or are reporters that routinely cover NASA (no names). I, of course, try to get the message out, but we all could work at doing this.

The scientific community has suffered a great loss in the passing of our colleague Dr. Graham Ryder. The CAPTEM committee and I will miss his extensive knowledge of the lunar collection. More than once he has been instrumental in determining the right samples for a particular study that has been proposed by a less collection-savvy scientist. See the memorial to Graham in this issue.

All of us at the Curatorial Facility are deeply saddened by the events of September 11, 2001. We are fortunate that our operations were not directly impacted, although there have been and will continue to be delays in daily operations. We have not sent out samples from the last round of allocations in October of 2001. All the allocations are completed, but distribution is awaiting approval of the CAPTEM-recommended allocation plan by NASA Headquarters. This process has been slowed by the added security for mail to Washington DC. We anticipate receiving approval shortly after LPSC. The next round of sample requests, which were due February 15, will be reviewed by CAPTEM immediately following the closing of LPSC 33.

I said this last time, but now I mean it. Our reorganization has been completed and our mail code is now ST. See the article by Carlton Allen in this issue about the Astromaterials Acquisition and Curation at JSC.

Requests for lunar samples for scientific study remain strong. We will send out 105 samples from the last round of allocations approved in October of 2001. Note that the next sample request deadline will be September 15 for the CAPTEM meeting in the fall of 2002. There continue to be requests for long-term display samples. Two displays were approved at the last meeting, which utilize our new case design, and will be exhibited at the American Museum of Natural History in New York and at the Indiana State Museum and Historic Sites in Indianapolis.



Astromaterials Acquisition and Curation at JSC

Carlton Allen

Astromaterials Curator

Manager, Astromaterials Acquisition and Curation Office

Mission of the Astromaterials Acquisition and Curation Office – to support the international planetary science community through:

- **Curation of current extraterrestrial sample collections**

The current collections are comprised of the Apollo lunar samples, meteorites collected in Antarctica by the joint NASA/National Science Foundation/Smithsonian Institution Antarctic Search for Meteorites program, cosmic dust collected by high-altitude aircraft, and space-exposed hardware.

- **Curation of samples from upcoming spacecraft missions**

These missions include two that have already launched and one that is planned for launch late this year. JSC curatorial personnel are active participants in the science teams for each of these missions.

- **Forward planning efforts for all funded and proposed sample return missions**

A number of sample return missions are in the pre-proposal stage or on NASA's future timeline. JSC curatorial personnel are active in the planning for each of these. As new sample return missions are conceived or proposed, we will continue to offer curatorial support.

- **Focused research and development in support of current and future sample curation**

JSC curatorial personnel are engaged in a wide-ranging research and development program that includes robotic sample curation, advanced surface treatments, detection of trace-level organic and microbial contamination, and an unprecedented combination of cleanliness and biosafety.

Remote Sample Collection

NASA policy requires that a portion of the lunar sample collection must be stored at a location remote from JSC. Currently 14 percent of the collection is stored at Brooks

Air Force Base in San Antonio, Texas. Within the next year the security status of these samples will change, as portions of the base are transferred to the city. We are currently initiating a project that will maintain the security

of the Remote Lunar Sample Collection by moving the samples to a new remote site.

Future Lunar Sample Laboratory Upgrade

The Lunar Sample Laboratory at JSC will be 25 years old in 2004. During that time, only routine preventive maintenance and occasional small-scale repairs have been required—a tribute to the original designers.

This year, a JSC Facilities Engineer is conducting a full infrastructure assessment of the Lunar Sample Laboratory. This assessment will form the basis for maintenance and repair activities during the next decade. At a minimum, we anticipate upgrading a portion of the air handling system, the environmental sensors and controllers, and

segments of the Laboratory floor and walls. This work will be planned and carried out in such a way as to prevent a compromise of the lunar samples and to minimize inconvenience to the lunar research community.

Security

The September 11 attacks and subsequent anthrax exposures have led to changes in the Astromaterials Laboratories and across JSC. Following an internal review, physical security in the laboratories has been increased. Procedures for shipping samples have been changed, particularly for non-US investigators. The requirements and processing time for a visitor to JSC have

increased—greatly so in the case of non-US citizens. In addition, the Lunar and Planetary Science Conference has been moved from JSC to the South Shore Harbour Resort & Conference Center.

We in the Astromaterials Acquisition and Curation Office continue our core missions—providing samples of extraterrestrial material to the international science and education communities and curating samples for future research. We welcome your comments and sample requests and look forward to the results of your research.



May 2 Proclaimed Space Day for 2002

Space Day is celebrated each year on the first Thursday in May. This award-winning global celebration is dedicated to the extraordinary achievements, benefits, and opportunities in the exploration of space. The goal of Space Day is to advance science, mathematics, and technology education and to inspire young people to realize the vision of our space pioneers. *Space Day 2002 . . . Adventure to Mars* will focus attention on expanding our scientific frontiers to one of Earth's nearest neighbors.

Memorial to Graham Ryder

Graham Ryder was a premier lunar scientist who pioneered many of our most important concepts about the Moon and its evolution. Graham passed away on January 5, 2002, as a result of complications from cancer of the esophagus. He received his B.Sc. from the University of Wales (Swansea) (1970) and his Ph.D. from Michigan State University (1974), specializing in the petrology of igneous rocks. He did post-doctoral study with John Wood's group at the Smithsonian Astrophysical Observatory, was subsequently employed by Northrup Services Inc. in the Lunar Curatorial Facility at NASA Johnson Space Center, and since 1983 has been a Staff Scientist at the Lunar and Planetary Institute in Houston. Graham's work was instrumental in several areas of lunar science. He was among the first to recognize evidence in the lunar sample collection that mare volcanism began very early, before the end of the "late heavy bombardment." Graham's work with highland rocks and breccias clarified the processes and history of the lunar crust. He produced detailed catalogs and guides to the Apollo lunar sample collections, facilitating the scientific work of the entire sample community. As a result of these efforts, he was intimately familiar with the sample collections and could recite detailed characteristics of various samples and the results of studies associated with each. Graham's work helped provide the basis for understanding the geological context and petrological characteristics of the samples, which greatly advanced our understanding of the Moon's evolution. As part of his interest in the geological process of impact, Graham studied terrestrial impact breccias and

melts and fully participated in the revolution in terrestrial geology that resulted from study of the Cretaceous-Tertiary impact and subsequent mass extinction. In recent years, Graham became interested in the problem of the early cratering history of the Moon (the so-called "lunar cataclysm") and undertook to obtain very precise radiometric ages of lunar impact melts to address this problem. This work produced revised estimates for the ages of major lunar impact events, a set of data that must be explained to unravel fully lunar history.

Graham's quick wit and insightful commentary enlivened many of the scientific meetings he organized, convened, and attended over the course of his career. Discussions that veered off track were soon brought back to point by Graham's encyclopedic knowledge of the sample collection. Graham thoroughly enjoyed the give and take of serious scientific debate, but he also enjoyed mischievously skewering pomposity, questioning conventional

wisdom, and reminding the community of inconvenient facts and constraints on newly proposed "syntheses" and models. Graham is survived by his daughter Abigail, his parents and siblings in England, and hundreds of friends and colleagues around the world. Lunar science has benefited greatly from Graham's work and our lives have been enriched by his presence. We will miss him.

*Paul D. Spudis
Lunar and Planetary Institute
Deputy Director, Staff Scientist*



Graham Ryder

Graham Ryder

1949 - 2002



Ryder Tributes

What a personal and intellectual vacuum has been left for everyone who encountered Graham or his ideas through the years. We only can fill that vacuum and repay our debt to him by continuing to try to answer all the questions he made us think about.

Jack Schmitt

His wit, sarcasm, and brilliance will be greatly missed in our community and beyond. Personally, I have lost a dear friend; I hope now he has all the answers.

Clive Neal

OOOOoooh, NO!!!

It HURTS . . .

- Because our being has just lost an important element of its wit.
- Because an enormous hole is now where a unique friend used to be.
- Because a delightfully cynical jewel has been ripped from our conscious.
- Because the best resource on lunar samples has disappeared.
- Because so much is left undone and unsaid.
- Because Graham reminds us that we all live in a transitional time.
- Because we will miss him deeply and will be reminded of this countless times.

Dammit!

Carle Pieters



*Graham working in the Lunar Curatorial Facility, June 2001
Pictured: Caroline Wannamaker (LPI intern), Graham Ryder (LPI Lunar Scientist), John Spray (Scientist, UNB, Canada), and Kathryn A. MacCarthy (LPI intern)*



Pictured (l-r): Phil Helmke, John Delano, Mike Drake, Tim Swindle, John Longhi, John Dietrich, A. Basu, and (kneeling) Graham Ryder



Pictured (l-r): John Longhi, Phil Helmke, Tim Swindle, Jim Papike, (front) Graham Ryder, John Delano, Paul Warren, and Dick Morris

Lab Tours



Raquel Jenkins (Space Center Houston), Charlie Galindo (HEI), and Lunar Growth Chamber students (Clear Creek ISD)



Russian Training Instructors and NASA Astronaut: Oleg Besyakov, Elena Gotovtseva, Boris Meshcheryakov, and Doug Wheelock



Dr. Carl Agee (Director, ARES) and Dr. Andreas Lutge (Earth Science Department, Rice University)



Amy Baker (Technical Administrative Services), Dr. Norman Wainwright (Marine Biological Laboratory, Woods Hole, MA), and Gary Lofgren (Lunar Sample Curator)

**See a “virtual tour” online at
<www-curator/jsc/nasa/gov>.**

**Scientists visiting JSC can request a tour by contacting
Gary Lofgren at 281-483-6187.**



How to Request Lunar Samples

NASA policies define lunar samples as a limited national resource and future heritage and require that samples be released only for approved applications in research, education, and public display. To meet that responsibility, NASA carefully screens all sample requests with most of the review processes being focused at the Lyndon B. Johnson Space Center (JSC). Individuals requesting a lunar sample should follow the steps given below for the appropriate category of sample.

1. RESEARCH SAMPLES (including thin sections)

NASA provides lunar rock, soil, and regolith-core samples for both destructive and non-destructive analysis in pursuit of new scientific knowledge. Requests are considered for both basic studies in planetary science and applied studies in lunar materials beneficiation and resource utilization.

A. The sample investigator demonstrates favorable scientific peer review of the proposed work involving lunar samples. The required peer review can be demonstrated in either of two ways: (1) A formal research proposal recommended by NASA's Lunar and Planetary Geosciences Review Panel (LPGRP) or an equivalent scientific peer-review panel, within the past three years; (2) Submittal of reprints of scientific articles, as published in peer-reviewed professional journals that directly pertain to the specific sample requested.

B. The investigator submits a written request specifying the numbers, types, and quantities of lunar samples needed, as well as the planned use of the samples. For planetary science studies, the sample request should be submitted directly to the Lunar Sample Curator at the following address:

Dr. Gary Lofgren
ST/Lunar Sample Curator
NASA/Johnson Space Center
Houston, TX 77058-3696 USA
Telephone: (281) 483-6187
Fax: (281) 483-5347
gary.e.lofgren1@jsc.nasa.gov

For new investigators, tangible evidence of favorable peer review (step A) should be attached to the sample request. Each new investigator should also submit a résumé.

Investigators proposing the application of new analytical methodologies (not previously applied to lunar samples) also should submit test data obtained for simulated lunar materials. New investigators who are not familiar with lunar materials should consult *Lunar Sourcebook: A User's Guide to the Moon* (G. Heiken, D. Vaniman, and B. M. French, Eds.; Cambridge University Press, 736 pp.; 1991; ISBN 0-521-33444-6) as the best available reference on the chemical and physical properties of lunar materials.

Investigators with access to the World Wide Web on the Internet also can find updated information at the following URL: <<http://www-curator.jsc.nasa.gov/curator/curator.htm>>. The home page cited above provides links to in-

formation of use to sample requestors.

C. The Lunar Sample Curator will research the availability of the requested samples and decide whether a unilateral action can be taken or an outside scientific review is required. Outside review is prescribed for all new investigators and for most established investigators except where returned (previously used) samples are being requested. For outside review, the Curator forwards the original request, with background information, to the Curation and Analysis Planning Team for Extraterrestrial Materials (CAPTEM), a standing committee of scientists who advise NASA on the care and use of lunar samples. CAPTEM checks for favorable peer review (step A) and appropriate sample selection (step B).

D. Given CAPTEM endorsement and concurrence by NASA Headquarters, the Lunar Sample Curator will prepare a Lunar Sample Loan Agreement for signature by the investigator's institution. The agreement includes a sample security plan that prescribes precautions to minimize prospects for theft or unauthorized use of lunar samples.

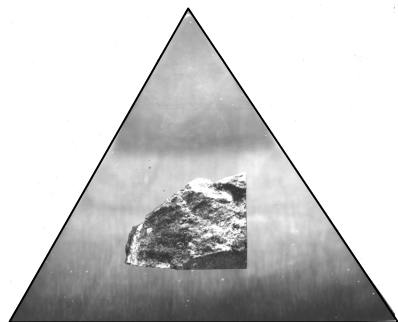
E. Upon receipt of the properly executed loan agreement, the Lunar Sample Curator prepares the authorized samples and sends them to the investigator. Quantities less than 10 grams can be sent directly by U.S. registered mail to domestic investigators. Shipments to foreign investigators are sent by U.S. diplomatic pouch mail to the American embassy

nearest the requestor's location. Quantities larger than 10 grams must be hand-carried by the investigator or his/her representative.

F. Continuation as a Lunar Sample Investigator. An investigator's privilege for retention and use of lunar samples is contingent upon continued good standing with the Office of the Curator. The investigator will remain in good standing by fulfilling the following obligations: (1) Maintenance of, and adherence to, the lunar sample loan agreement and security plan; (2) Timely cooperation with annual lunar sample inventory; (3) Timely cooperation with sample recalls.

2. PUBLIC DISPLAY SAMPLES

NASA provides for a limited number of rock samples to be used for either short-term or long-term displays at museums, planetariums, expositions, or professional events that are open to the public.



Requests for such display samples are administratively handled by the JSC Public Affairs Office (PAO). Requestors located in the United States should apply in writing to the following address:

Mr. Louis A. Parker
Lunar Sample Specialist
AP/Public Affairs
NASA/Johnson Space Center

Houston, TX 77058-3696
Telephone: (281) 483-8622
Fax: (281) 483-4876

Mr. Parker will advise successful applicants regarding provisions for receipt, display, and return of the samples. All loans will be preceded by a signed loan agreement executed between NASA and the requestor's organization. Mr. Parker will coordinate the preparation of new display samples with the Lunar Sample Curator.

3. EDUCATIONAL SAMPLES (disks and educational thin sections)

A. Disks

Small samples of representative lunar rocks and soils, embedded in rugged acrylic disks suitable for classroom use, are made available for short-term loan to qualified school teachers. Each teacher must become a certified user of the disks through a brief training program prior to receiving a disk. Educational sample disks are distributed on a regional basis from NASA field centers located across the United States. For further details, prospective requestors should contact the nearest NASA facility as follows:

IF YOU LIVE IN:

<i>Alaska</i>	<i>Nevada</i>
<i>Arizona</i>	<i>Oregon</i>
<i>California</i>	<i>Utah</i>
<i>Hawaii</i>	<i>Washington</i>
<i>Idaho</i>	<i>Wyoming</i>
<i>Montana</i>	

NASA Teacher Resource Center

Mail Stop 226-4
NASA Ames Research Center
Moffett Field, CA 94035-1000
Phone: (650) 604-5544

IF YOU LIVE IN:

<i>Connecticut</i>	<i>New Hampshire</i>
<i>Delaware</i>	<i>New Jersey</i>
<i>New York</i>	<i>Maine</i>
<i>Pennsylvania</i>	<i>Maryland</i>
<i>Rhode Island</i>	<i>Massachusetts</i>
<i>Vermont</i>	
<i>District of Columbia</i>	

NASA Teacher Resource Laboratory

Mail Code 130.3
NASA Goddard Space Flight Center
Greenbelt, MD 20771-0001
Phone: (301) 286-7206

IF YOU LIVE IN:

<i>Colorado</i>	<i>North Dakota</i>
<i>Kansas</i>	<i>Oklahoma</i>
<i>Nebraska</i>	<i>South Dakota</i>
<i>New Mexico</i>	<i>Texas</i>

NASA Teacher Resource Room

Mail Code AH-2
NASA Johnson Space Center
Houston, TX 77058-3696
Phone: (281) 483-0235

IF YOU LIVE IN:

Florida
Georgia
Puerto Rico
Virgin Islands

NASA Educators Resource Laboratory

Mail Code XA-D2
NASA Kennedy Space Center
Kennedy Space Center, FL
32899-0001
Phone: (321) 867-4444

IF YOU LIVE IN:

Kentucky
North Carolina
South Carolina
Virginia
West Virginia

NASA Teacher Resource Center
for Langley Research Center
Mail Stop 400
17 Langley Boulevard
Hampton, VA 23669-4033
Phone: (757) 864-9728

IF YOU LIVE IN:

<i>Illinois</i>	<i>Minnesota</i>
<i>Indiana</i>	<i>Ohio</i>
<i>Michigan</i>	<i>Wisconsin</i>

NASA Teacher Resource Center
Mail Stop 7-4
NASA Glenn Research Center
21000 Brookpark Road
Cleveland, OH 44135-3191
Phone: (216) 433-2957

IF YOU LIVE IN:

<i>Alabama</i>	<i>Louisiana</i>
<i>Arkansas</i>	<i>Missouri</i>
<i>Iowa</i>	<i>Tennessee</i>

NASA Teacher Resource Center
for Marshall Space Flight Center
Mail Stop CD60
Huntsville, AL 35812-0001
Phone: (256) 544-2849

IF YOU LIVE IN:

Mississippi

NASA Teacher Resource Center
Building 1100
Mail Code AA10
NASA John C. Stennis Space Center
Stennis Space Center, MS
39529-6000
Phone: (228) 688-2091

B. Thin Sections

NASA prepared thin sections of representative lunar rocks on rectangular 1- x 2-inch glass slides, with special safety frames, that are suitable for use in college and

university courses in petrology and microscopic petrography for advanced geology students. Each set of 12 slides is accompanied by a sample disk (described above) and teaching materials. The typical loan period is two weeks, including round-trip shipping time. Each requestor must apply in writing, on college or university letterhead, to the following address:

Dr. Marilyn Lindstrom
SR/Education Sample Curator
NASA/Johnson Space Center
Houston, TX 77058-3696
Telephone: (281) 483-5135
Fax: (281) 483-5347

For each approved user, the Curator will prepare a loan agreement to be executed between NASA and the requestor's institution prior to shipment of the thin-section package. □

